Viscosity Measurements and Predictions for Natural Gas Mixtures

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A vibrating-wire viscometer of very high precision was used to measure the viscosity coefficient of methane and of two natural gas mixtures. The experimental data were, in general, taken at temperatures of 260 K, 280 K, 300 K and 320 K and pressures up to 20 MPa and additionally in the case of methane at temperatures of 340 K and 360 K and at pressures up to 29 MPa. The estimated uncertainty is 0.3% and 0.5% for methane and the natural gas mixtures, respectively.

The new experimental data for methane were used together with literature data to calculate a zero-density viscosity correlation. For nitrogen, carbon dioxide, ethane, propane, n- and iso-butane, n- and iso-pentane, hexane, heptane and octane, zero-density viscosity correlations were deduced from literature data. The mixing rule of Wilke [1] was applied for a zero-density viscosity correlation of mixtures. The residual viscosity defined by the parameter of Dean and Stiel [2] was used for the density dependence which was correlated with methane data only. For methane the agreement between the correlated and experimental data is better than 0.5%. The values predicted with the correlation and the experimental data agree within 0.8% for the two natural gas mixtures.

[1] C.R. Wilke, J. Chem. Phys. 18, 517 (1950).
[2] D.E. Dean and L.I.Stiel, A. I. Ch. E. J. 11, 526 (1965).